Methods Advancement for Milk Analysis: Successful Inter-Agency and National Health and Environmental Effects Research Laboratory (NHEERL) Collaborations

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Breast milk is the most complete food for the developing infant, making it imperative that accurate and reliable methods are available for its analysis. Infants of nursing mothers represent a special population that may be exposed to these environmental toxicants because breast milk contains a high proportion of lipid, in which these toxicants accumulate. As a pilot study for the National Children's Study (NCS) and in response to the ORD Government Performance and Results Act (GPRA) Goal 4, scientists at the U.S. Environmental Protection Agency (U.S. EPA) and the CDC are collaborating to conduct the MAMA (Methods Advancement for Milk Analysis) study. In this ongoing study, women donate milk and other biological samples at two specified intervals during early lactation. Samples are analyzed for two classes of components: endogenous (U.S. EPA) and exogenous (CDC). The MAMA study goals are to (1) define collection, preservation, and storage recommendations for human milk samples; (2) provide reliable assays to measure defined endogenous and exogenous constituents of fresh and frozen human milk; and (3) evaluate blood, saliva, and urine as surrogate media for the analysis of milk constituents. The CDC will also evaluate partitioning and time course of clearance of exogenous milk components. The U.S. EPA is measuring endpoints such as immune response, mutagenicity, metabolic enzyme levels, milk quality, and gene expression. NCS funds were used to develop reliable assays for measurement of milk components, hormones, immunoglobulins, and growth factors, which are being measured in milk and serum. The CDC will use human milk, blood, saliva, and urine to measure and compare environmental lipophilic agents, pesticides, and other compounds identified as endocrine disruptors. The U.S. EPA and CDC partners have evaluated the lab materials, breast pump components, and storage conditions used in the study to ensure no residual contamination of the samples. They have also performed rodent studies to evaluate the clearance, partitioning, and disposition of atrazine and its metabolites to ensure that the assays used in the MAMA study, as well as other studies by the CDC (e.g., National Health and Nutrition Examination Survey), are sensitive and accurate for this high-use

herbicide, as well as to have a foundation of comparison for other pesticides. This study, with its many partners, will produce excellent quality data that will be compared and shared across the laboratories involved to address possible associations between exposures and responses. These data will allow for development of future studies aimed at identifying health outcomes of such exposures.

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